Transformations of Quadratics $y = x^2$ Versus $y = ax^2$ **Date:**________________

EX: **Sketch the graphs of the following on the same axes.**

A. $y = x^2$ **B.** $y = 2x^2$ **C.** $y = -3x^2$

D. $y = \frac{1}{2}x^2$

Results: To graph $y = ax^2$:

When "a" is positive, the parabola faces up, so the vertex is a minimum. When "a" is negative, the parabola faces down, so the vertex is a maximum. When the parabola faces down, we say the parabola is a reflection in the x axis from the base parabola $y = x^2$.

When "a" is > 1 (any number larger than 1) the parabola gets taller and thinner - which is called a "vertical stretch".

When "a" is < 1 (any decimal or fraction less than 1) the parabola gets shorter and wider - which is called a "vertical compression".

The vertex is still (0, 0) and the axis of symmetry is still x = 0.
So, we call "a" in $y = ax^2$ the "shape changer".

To graph, do not use table of values, use the step patterns.

For $y = x^2$, the pattern from the vertex is:

over 1, up 1
over 1, up 3
over 1, up 5
over 1, up 7
Etc.

To graph $y = ax^2$, multiply the above "up numbers" in the step pattern by "a".

EX: Graph the following by using the "step pattern".

A. $y = 3x^2$

B. $y = \frac{1}{4}x^2$